

Travel Related Inputs Model for Mobile 6.x (TRIMM)

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Purpose

- Overview of development of TRIMM (for Travel Related Inputs Model to MOBILE6) based on multiyear NPTS data
- Discuss TRIMM applications for small and medium communities
- Demonstration of TRIMM

Organization

- Background on M6 travel variables
- An overview of state of the practice
- The need for a simplified tool or method
- NPTS database as a potential mine for travel inputs
- Drawbacks of NPTS for the stated purpose
- Sensitivity analysis of M6 with NPTS travel inputs
- TRIM development and demo

MOBILE6

- **Emission factor model**
 - For highway motor vehicles
- **Calculates emission factors for 3 pollutants**
 - Hydrocarbons (HC)
 - Carbon Monoxide (CO)
 - Nitrogen Oxides (NOx)
- **28 individual vehicle types.**
- **Calendar year between 1952 and 2050**



Personal Travel Variables Affecting Emissions

- Distribution of trip starts by hour of day
- Cold soak distribution
- Hot soak activity
- Vehicle engine starts per day
- Vehicle trip length distribution
- VMT Mix by vehicle class
- VMT by hour of the day



Vehicle Activity Inputs

- Vehicle start distribution
 - 24 hours
 - weekday and weekend
- Starts per day
 - 28 different vehicle classes
 - 25 vehicle age classes
- Cold soak distribution
 - 70 soak intervals
 - 24 hours
 - weekday and weekend
 - 3,360 possible values

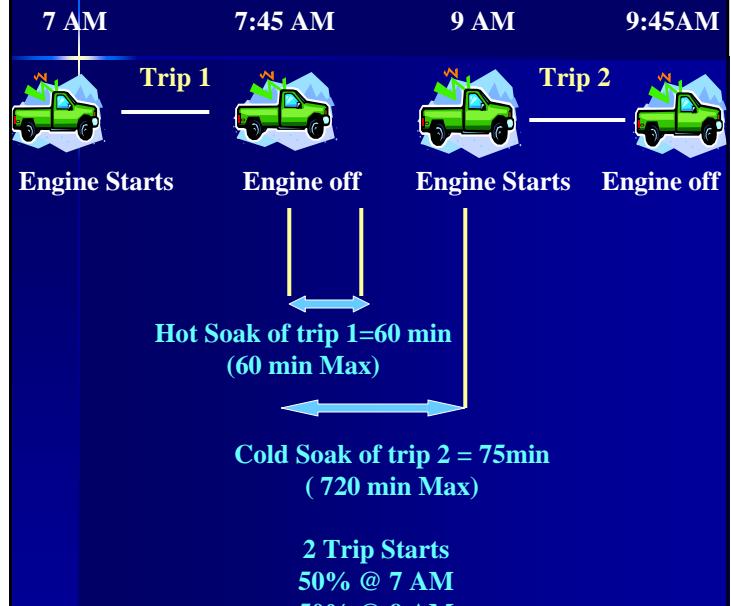


Vehicle Activity Inputs (cont.)

- **Hot soak activity**
 - 1-60 minutes at 1 minute intervals
 - 14 time periods
 - weekday and weekend are different
 - As many as 840 values
- **VMT fractions by hour of day**
 - 24 hours
 - Vehicle types are not differentiated



Illustration



Travel Activity Inputs (cont.)

- **Trip length distribution**
 - 6 trip length ranges
 - 14 hourly groups
 - Separate for weekday and weekend values
 - Maximum 84 values
- **VMT Mix by vehicle class**
 - 18 combined vehicle classes
 - No differentiation by type of fuel used



Potential Sources of Travel Activity Inputs

- **VMT fractions – HPMS Traffic counts, Travel Demand Models**
- **Starts distribution – Travel surveys**
- **Hot soak and cold soak activity – Travel surveys**
- **Trip length distribution – Travel demand models, Travel surveys**



M6 Soak Interval Classification

Soak Interval Number, N	Range of Soak Time
1	Greater than 0.01 and \leq 1.0 minutes
2 to 30	Greater than $(N-1)$ and $\leq N$ minutes
31 to 45	Greater than $(2n-32)$ and $\leq (2N-30)$ minutes
46 to 67	Greater than $(30N-1,320)$ and $\leq (30N-1,290)$ min
68	Greater than 720 minutes
69	Greater than zero, but less than 0.01
70	Zero minutes (stalls, not used)



Translation....

M6 Soak Period inputs

■ Daily engine soak time distribution by hour

- 70 soak intervals
- weekday
- weekend
- up to 3,360 values

■ Hot soak distribution

- 14 time periods
- weekday
- weekend
- up to 840 values

At Issue

- Most agencies are using M6 defaults for these inputs
- Why use defaults?
- Why not “local” data?
 - How do we get local data?
 - What are the difficulties?
- Defaults vs. local data
 - What is the deal with differences in input?
 - How do they affect emission factors?

At Issue (cont.)

- Possible answer
 - Travel Inputs from Surveys
- Ideal Solution
 - A nationwide resource providing data on personal travel behavior
- Nationwide Personal Transportation Survey (NPTS) data offers some promise



NPTS Data Characteristics

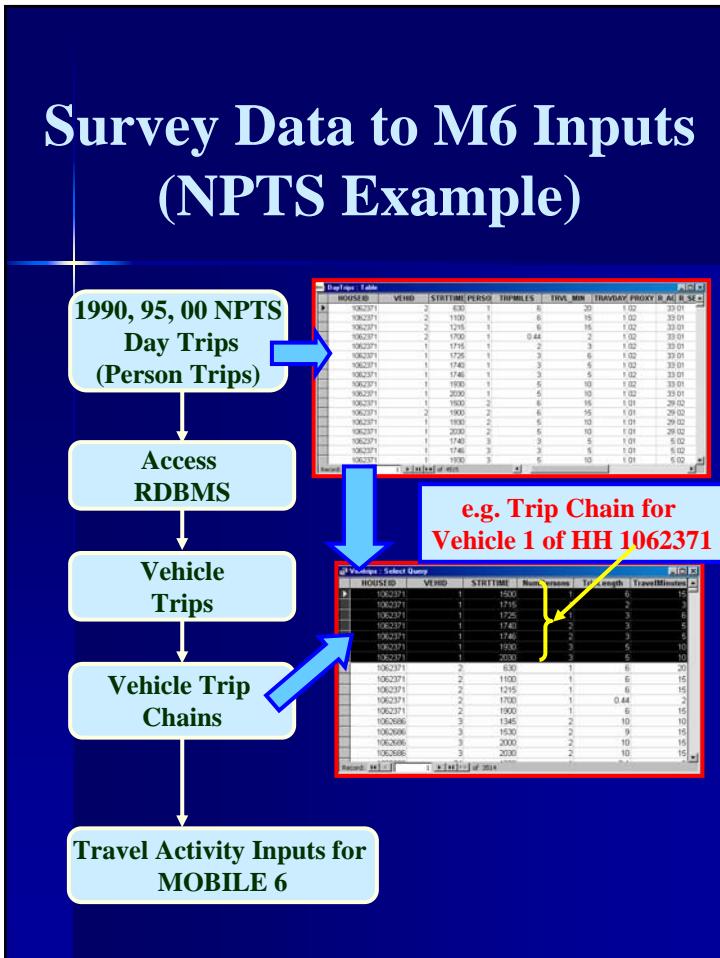
- **National Inventory of daily personal travel**
- **Conducted periodically (every 5 to 7 years)**
- **Authoritative source of national data on the daily trips including**
 - purpose of the trip
 - means of transportation used
 - trip length (minutes & miles)
 - vehicle attributes
 - vehicle occupancy**



Our Mission

- Dig deep into NPTS
- See how useful its data are for M6 inputs
 - Can we get meaningful inputs from NPTS?
 - Are these inputs different from M6 defaults?
 - How do they affect emission factors?
- Lump the analysis and findings into a automated tool
 - TRIMM (Travel Related Inputs Model to MOBILE6)

Survey Data to M6 Inputs (NPTS Example)

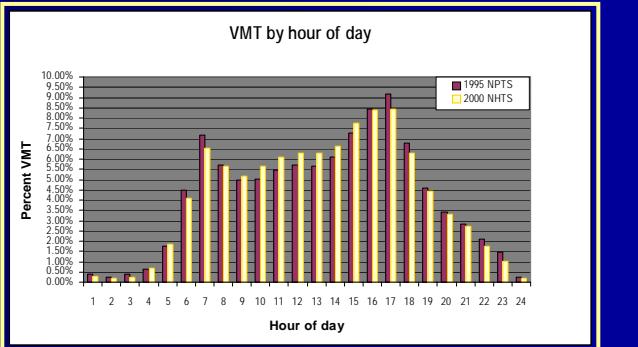


Issues with Data Screening and Analysis

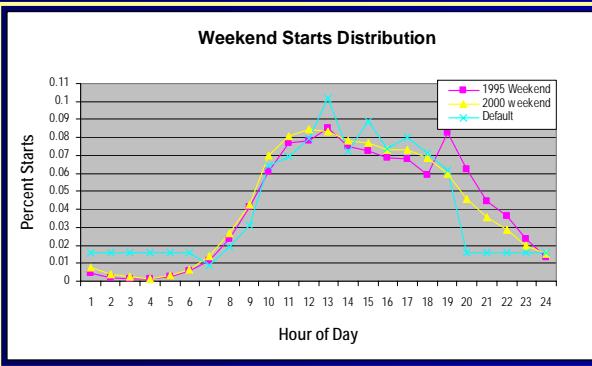
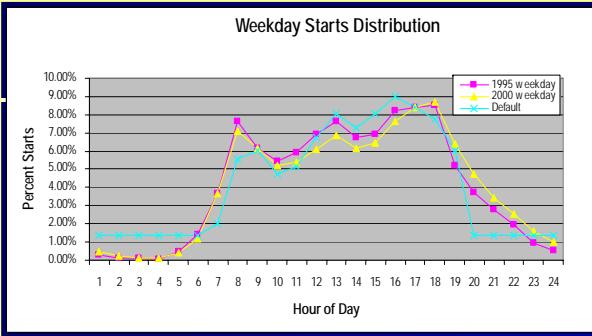
- **Vehicle trips with overlapping trip durations**
 - showed negative soak periods
 - flagged and omitted
- **Vehicle trips with same times for trip end and the next trip start**
 - i.e. hot soak = 0
 - **M6 hot soak distribution - 1 to 60 minutes**
 - **Our resolution:**
 - assumed hot soak = 1 minute



Comparison of Starts and VMT Distribution



Comparison of starts Distribution



Data Gaps

Cold Soak

- Insufficient data to fill all the 3,360 cells
- Fewer trips during nights
- Consolidating time periods enhances the use of data

Starts Per day

- 25 vehicle age groups and 3 vehicle types
- 75 values (each for weekday and weekend)
- Insufficient data to fill all the 150 cells.



Data Gaps

Starts Per Day Variable

Nationwide Weekday Starts			
Vehicle age	LDGV	LDGT1	LDGT2
1	14	17	12
2	1130	294	634
3	7148	1368	2936
4	8308	1810	2956
5	3828	110	211
6	7843	1340	2144
7	7553	1256	1798
8	7632	1201	1803
9	8872	1343	2288
10	7772	1603	1528
11	7755	1389	1421
12	6870	1338	1006
13	4892	1024	804
14	4224	721	623
15	2162	434	293
16	1290	337	131
17	1044	284	95
18	882	204	66
19	653	352	193
20	754	277	142
21	529	229	45
22	257	85	56
23	200	64	28
24	80	80	36
>=25yrs	767	414	109

Nationwide Weekend Starts			
Vehicle age	LDGV	LDGT1	LDGT2
2	411	64	160
3	1985	433	976
4	2567	516	1009
5	2367	340	770
6	2395	358	661
7	2325	404	524
8	1926	312	466
9	2376	437	441
10	2376	336	410
11	1760	365	390
12	1598	343	332
13	1305	181	243
14	1474	167	234
15	585	83	72
16	486	77	25
17	346	93	25
18	280	74	17
19	280	114	48
20	208	63	8
21	111	44	20
22	105	30	10
23	46	20	11
24	33	19	15
>=25yrs	245	114	55

Washington Weekday Starts			
Vehicle age	LDGV	LDGT1	LDGT2
1			
2	22		16
3	106	6	38
4	98	15	29
5	72	14	15
6	69	16	27
7	80	6	14
8	141	18	11
9	87	21	6
10	81	2	5
11	71		8
12	46	14	17
13	36	8	2
14	29		10
15	17	3	
16	7		
17	6		
18	15		
19	4	2	
20	5		2
21	4		2
22	1	2	
23			
24			
>=25yrs	7		

Washington Weekend Starts			
Vehicle age	LDGV	LDGT1	LDGT2
1			
2	4		5
3	25	11	10
4	32		11
5	26	5	4
6	25	5	40
7	48	2	26
8	27		1
9	53		
10	27		15
11	34	2	
12	30	1	7
13	22		4
14	27		
15	6		2
16		5	
17			2
18			
19			
20			
21		2	
22			
23			5
24			
>=25yrs	4		

Soak Interval Matrix NPTS (1995) - Nationwide

	Time of Day																									
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
1	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
2	2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
3	2	1	1	2	3	7	37	109	134	107	99	119	117	99	110	136	88	68	46	36	18	13	10	3		
4	2	2	1	2	8	29	136	201	221	178	226	224	188	222	285	183	162	99	77	64	37	14	9			
5	1	4	4	1	3	11	53	170	178	118	109	100	102	107	102	262	326	239	139	108	57	26	21			
6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
7	4	4	1	1	2	25	72	122	112	137	158	164	155	186	181	188	184	118	78	67	43	19	11			
8	1	1	1	1	2	4	22	28	43	41	38	34	33	41	49	48	47	41	29	23	6	5	8			
9	3	4	2	1	1	8	41	118	122	75	76	91	92	67	105	90	24	336	221	170	73	41	10			
10	3	2	1	1	1	1	10	19	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	3		
11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
12	1	1	1	1	1	1	1	1	6	35	43	58	66	79	58	52	73	79	16	50	31	17	6	1		
13	1	1	1	1	1	1	1	1	7	28	29	12	24	28	35	26	26	29	61	65	55	11	25	9		
14	2	1	1	1	1	1	1	1	7	24	24	24	24	24	24	24	24	24	43	43	43	31	3	3		
15	10	3	1	1	1	3	26	66	143	180	231	286	284	235	263	287	324	321	243	54	109	85	51	19		
16	1	1	2	1	1	1	3	18	15	22	24	25	33	30	28	38	28	28	15	17	17	4	1	1		
17	2	1	1	1	1	1	3	6	18	25	28	35	39	33	35	40	62	46	51	51	28	14	8	3		
18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
19	1	1	1	1	1	1	1	1	1	12	56	124	179	221	218	185	202	272	138	88	55	13	19	20		
20	3	1	1	1	1	1	4	12	43	51	39	48	54	58	38	47	57	157	20	152	134	111	34	21	7	
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25	6	1	1	1	1	1	8	57	109	171	212	230	197	161	224	119	61	56	24	20	11	7	2			
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32	2	1	1	1	1	1	3	16	44	80	123	144	211	186	145	143	137	64	45	28	25	25	5	2		
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34	2	1	1	1	1	2	1	8	18	38	56	57	70	95	57	72	67	69	69	69	36	35	15	2		
35	6	3	1	1	1	2	1	9	24	60	104	125	155	175	182	154	161	196	122	120	120	26	11			
36	1	1	1	1	1	2	5	25	38	60	58	84	84	63	46	35	25	29	20	8	1	1	1			
37	1	1	1	1	1	1	1	1	1	6	28	18	23	23	16	28	50	45	22	30	25	10	6	2		
38	1	2	1	1	1	1	1	4	8	19	62	81	136	137	186	203	142	157	167	160	188	137	71	31	16	
39	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
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41	2	1	1	1	1	1	4	8	24	39	50	45	78	103	54	57	57	66	48	52	36	19	4	2		
42	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
43	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
44	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
45	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
46	20	12	6	4	6	3	15	102	232	426	592	751	79	840	899	872	670	322	322	164	64					
47	7	12	6	4	6	3	15	102	232	426	592	751	79	840	899	872	670	322	322	164	64					
48	29	16	6	2	1	4	8	13	35	115	254	340	296	346	358	398	370	386	437	400	360	373	166	64		
49	29	21	1	2	5	3	8	8	15	68	164	308	273	214	287	346	360	315	286	299	347	167	71			
50	3	19	10	5	4	10	10	10	29	7	7	175	625	873	567	123	44	27	30	40	108					
51	20	11	5	9	14	13	7	12	1	10	16	127	348	219	156	129	49	160	141	98	127	115	61			
52	29	10	12	1	5	4	10	12	1	10	16	127	348	219	156	129	49	160	141	98	127	115	61			
53	19	12	8	5	10	16	19	8	9	17	16	21	269	119	124	166	74	43	75	89	50					
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56	21	8	3	2	15	21	44	35	24	10	54	50	249	229	130	74	43	33	29	33	31	31	31			
57	20	7	3	14	32	57	64	39	12	2	6	12	28	188	291	147	109	62	47	24	14	38	29			
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59	16	12	8	25	52	152	244	87	31	20	7	7	175	625	873	567	123	44	27	30	40	108				
60	14	8	4	17	64	178	256	115	39	14	4	3	14	46	246	562	147	156	33	20	22	32	47			
61	12	5	3	25	82	207	266	186	30	47	10	5	12	24	46	205	125	263	293	189	56	22	13	12		
62	13	6	2	26	84</																					

Soak Interval Matrix NPTS (1995) – Virginia

	Hour of Day																								
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
2		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
3			1	2	3	2	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	1	3	
4	1			1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
5				1	1	2	3	2	2	2	3	2	2	3	2	2	3	1	4	2	3	3	3	3	
6					2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	
7					1	2	1	1	2	4	1	1	2	4	1	1	2	4	2	1	1	1	1	1	
8						1	2	1	1	2	4	1	1	2	4	1	1	2	4	1	1	1	1	1	
9							1	2	1	1	2	4	1	1	2	4	1	1	2	4	1	1	1	1	
10							1	1	2	3	4	5	6	7	8	5	4	4	1	1	1	1	1	1	
11								1	1	2	2	2	2	2	2	1	5	2	2	2	2	1	1	1	
12									1	1	1	1	1	1	1	1	1	2	4	1	1	1	1	1	
13									1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
14										1									1					1	
15											2	3	1	3	3	3	2	4	6	3	1	3	6	1	2
16												1	1	1	1	1	1	1	1	1	1	1	1	1	1
17												1	1	1	1	1	1	1	1	1	2	2	1	1	
18												1	1	3	1	1	1	1	1	1	1	1	1	1	1
19												1	2	2	2	2	2	2	2	2	2	2	2	2	2
20												2	1	1	1	1	1	1	2	1	4	3	2	2	1
21													1									1			
22													1									2	1	1	1
23														2									2	1	1
24														1									2	1	1
25														4									1	4	2
26														2									2	1	1
27														2									1	3	1
28														1									1	1	1
29															2									1	1
30														1										1	1
31														5										1	1
32														1										1	1
33														2										1	1
34														1										1	2
35														1										1	1
36														1										5	3
37														3										1	1
38														3										5	1
39														2										1	1
40														1										3	1
41														1										1	1
42														1										3	2
43														1										1	1
44														1										1	1
45														1										1	1
46														4										2	1
47														2										10	5
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49														3										10	7
50														4										6	3
51														3										3	1
52														5										3	1
53														2										5	2
54														1										2	5
55														1										2	1
56														2										4	1
57														1										1	1
58														1										1	1
59														3										1	1
60														1										1	1
61	1	2												2										1	3
62														1										2	1
63														1										4	1
64	1													2										5	1
65														2										7	1
66														3										2	1
67	1	1												2										3	1
68		3	10	48	60	58	51	36	25	8	16	13	8	10	5	8	3	5	3	3	2	1	1		

Condensed Soak Interval Matrix Nationwide

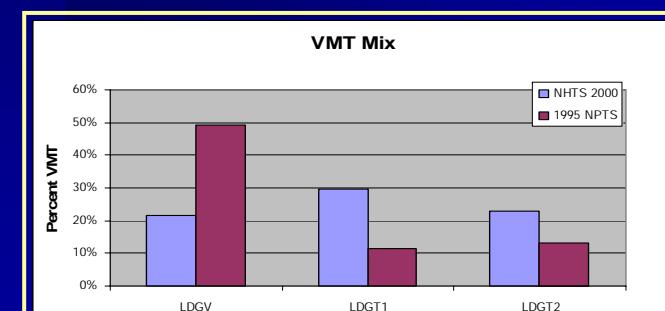
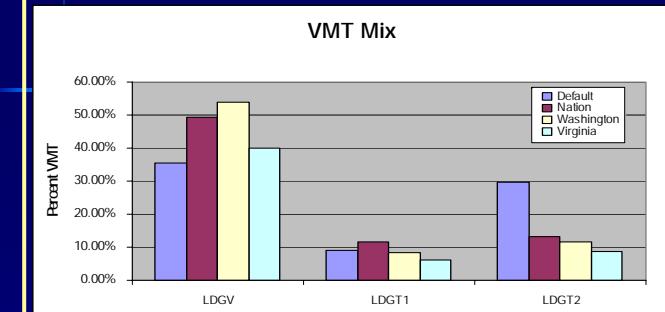
Time of Day													
SAM 7AM	SAM 8AM	SAM 9AM	SAM 10AM	SAM 11AM	SAM 12PM	SAM 1PM	SAM 2PM	SAM 3PM	SAM 4PM	SAM 5PM	SAM 6PM	SAM 7PM	SAM 8PM
1 190	565	628	660	364	373	378	400	1280	541	496	344	217	367
2 22	61	151	139	101	101	257	125	90	93	96	96	117	117
3 88	151	151	139	124	163	163	163	163	57	57	57	57	57
4 39	149	230	277	252	299	284	855	224	189	123	95	158	24
5 73	162	203	156	152	153	153	475	312	372	261	163	263	263
6 14	28	57	101	101	157	203	221	209	663	274	217	20	23
7 29	33	111	157	157	203	221	221	221	663	274	217	103	103
8 5	23	32	54	55	55	49	153	60	63	55	34	44	31
9 54	137	130	97	114	120	120	327	304	398	288	208	210	36
10 15	51	103	294	303	349	349	940	224	101	71	71	71	71
11 8	41	65	130	131	149	149	147	378	55	19	11	7	8
12 1	7	38	60	76	85	91	251	99	121	68	47	72	7
13 15	22	32	32	26	42	42	103	75	41	57	57	57	57
14 1	2	30	31	31	45	45	139	65	59	54	32	45	9
15 35	76	163	242	310	389	389	1039	411	389	306	193	321	376
16 8	20	18	24	37	42	42	116	35	17	20	17	27	2
17 1	17	29	32	53	53	53	151	44	37	44	38	58	11
18 6	9	31	61	72	78	78	244	248	45	45	25	19	24
19 4	12	66	177	248	314	279	775	187	81	61	40	56	6
20 29	51	151	151	44	64	64	775	795	250	250	250	250	250
21 2	4	12	12	20	29	29	23	89	27	14	12	15	14
22 2	12	29	90	90	112	122	141	373	103	81	81	87	99
23 2	9	15	29	29	39	39	116	85	81	81	81	81	8
24 13	34	48	37	33	34	34	62	126	173	241	299	178	191
25 2	9	78	147	227	293	302	804	154	72	67	64	51	17
26 15	35	52	92	92	132	132	258	68	9	9	9	11	3
27 1	9	37	51	51	51	51	159	66	62	62	62	46	44
28 3	16	15	14	16	19	26	70	34	37	49	37	35	7
29 2	4	9	16	16	28	31	107	47	32	22	22	22	2
30 14	45	145	195	259	327	328	225	225	225	225	225	141	141
31 1	8	13	26	41	40	47	173	42	63	46	38	48	4
32 4	21	52	112	172	193	280	639	184	81	51	38	45	7
33 8	30	61	131	131	131	131	131	131	164	174	174	126	14
34 5	12	20	27	68	95	121	309	301	81	77	68	67	67
35 13	36	84	129	169	212	281	675	238	228	230	149	206	28
36 2	36	30	49	78	81	81	110	263	63	50	35	33	1
37 4	8	33	29	29	24	25	116	116	116	116	116	116	116
38 14	22	75	102	185	192	192	479	661	205	195	228	172	167
39 2	6	25	39	48	56	56	81	192	47	51	49	32	43
40 19	71	71	71	71	71	71	209	598	205	222	222	247	247
41 6	8	27	50	68	68	68	105	282	75	61	64	74	8
42 4	22	51	28	44	43	53	139	52	168	168	162	202	10
43 2	7	31	31	31	31	31	795	189	189	189	189	189	189
44 2	6	19	24	33	41	42	339	49	77	61	60	75	9
45 8	26	33	88	142	161	165	488	147	110	110	147	119	170
46 21	116	285	565	804	1089	1089	3101	3268	959	1159	1159	1445	1171
47 20	15	24	20	69	70	70	219	279	55	55	55	253	253
48 16	15	137	319	465	499	549	543	549	499	497	497	1169	1169
49 15	14	88	194	384	438	438	1192	487	495	424	424	1030	1030
50 14	13	44	137	334	334	334	959	244	244	244	244	798	798
51 12	7	11	30	350	529	529	838	491	283	283	283	295	217
52 19	10	7	13	50	234	234	710	331	516	198	181	1454	191
53 11	1	13	13	144	144	144	144	144	144	144	144	142	142
54 24	21	12	173	173	173	173	656	146	267	278	108	108	108
55 67	8	6	14	29	29	105	511	154	154	186	180	90	215
56 60	13	8	8	7	21	62	508	124	124	144	83	183	137
57 29	30	33	33	33	33	33	144	138	138	138	138	138	138
58 104	76	42	14	5	5	18	549	167	144	93	73	121	166
59 172	138	79	16	9	3	20	511	311	311	97	49	126	126
60 117	104	34	16	18	18	18	129	129	129	129	129	217	217
61 234	246	52	31	12	8	8	909	905	669	141	55	139	139
62 270	282	12	62	12	4	4	332	583	79	173	51	100	157
63 334	334	87	87	42	18	18	414	305	459	207	80	80	80
64 334	340	221	221	47	42	42	53	144	144	208	208	70	88
65 342	426	246	19	81	36	19	39	84	204	82	67	70	70
66 367	411	285	159	87	30	22	89	29	147	80	56	56	56
67 463	463	286	174	174	174	174	174	174	174	174	174	70	70
68 3971	3993	4991	4995	3409	3430	2423	714	4139	299	753	556	556	571

Condensed Soak Interval Matrix, Washington D.C

	Time of Day														
	SAM-7AM	7AM-8AM	8AM-9AM	9AM-10AM	10AM-11AM	11AM-12NOON	12NOON-1PM	1PM-4PM	4PM-5PM	5PM-6PM	6PM-7PM	7PM-8PM	8PM-9PM	9PM-10PM	10PM-5AM
1	1	9	6	7	2	5	3	14	7	9	2	5	6	1	
2	1	2	1	1	2	3	3	1	1	1	1	1	2	1	
3	1	1	1	1	2	3	3	1	1	1	1	1	1	1	
4	3	1	3	3	3	3	1	4	5	1	2	1	1	1	
5	1	1	1	4	1	2	4	3	5	4	4	1	1	1	
6	2	1	1	1	1	1	1	1	1	1	1	1	1	1	
7	1	2	1	7	2	2	6	4	2	1	1	1	1	1	
8	1	1	1	1	1	1	1	4	3	3	2	3	4	1	
9	1	1	1	2	2	3	3	7	15	2	1	1	1	1	
10	1	3	2	2	2	3	3	7	15	2	1	1	1	1	
11	1	1	1	3	1	2	1	2	1	1	1	1	1	1	
12	1	1	1	1	1	1	1	1	2	2	3	1	1	2	
13	1	1	1	1	1	1	1	1	1	2	1	1	1	1	
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
15	1	6	5	6	3	5	5	5	3	4	4	4	4	4	
16	1	1	1	3	2	1	1	1	1	1	1	1	1	1	
17	1	1	1	1	1	1	1	2	3	1	1	1	1	1	
18	2	3	3	1	1	1	1	1	1	1	1	1	1	1	
19	1	3	3	3	3	4	1	1	2	1	1	1	1	1	
20	1	1	1	1	1	2	3	1	4	4	3	3	3	3	
21	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
22	1	1	1	1	2	4	2	3	2	3	2	2	2	2	
23	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
24	1	2	1	1	1	1	1	2	2	2	3	1	2	1	
25	1	2	7	2	4	8	4	1	1	1	1	1	1	1	
26	1	1	1	1	1	2	1	1	1	1	1	1	1	1	
27	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
28	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
29	1	3	3	2	2	5	6	1	2	2	1	1	1	1	
30	1	3	3	2	2	5	6	1	2	2	1	2	1	1	
31	1	1	1	1	1	1	1	1	1	1	3	1	1	1	
32	1	2	2	3	6	3	3	3	3	3	3	3	3	3	
33	1	1	1	1	2	2	1	1	4	1	2	1	1	1	
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36	1	1	1	1	1	2	3	1	1	1	1	1	1	1	
37	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
38	2	1	1	1	2	1	6	3	1	2	3	1	1	1	
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40	1	2	1	1	2	1	1	1	2	2	2	2	2	2	
41	1	2	1	1	1	1	1	1	1	1	1	1	1	1	
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44	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
45	1	1	3	3	2	6	1	1	1	1	3	1	1	1	
46	2	2	3	11	9	11	40	13	7	7	11	11	11	2	
47	5	7	7	6	8	23	4	10	3	6	10	10	10	1	
48	3	11	11	11	11	6	2	6	7	7	14	14	14	1	
49	1	1	2	4	9	6	7	4	5	5	10	10	10	2	
50	1	1	1	4	15	2	3	3	3	3	10	10	10	2	
51	1	2	2	5	6	6	6	2	1	1	7	7	7	1	
52	1	1	2	6	10	2	7	2	1	5	2	2	2	2	
53	1	2	3	6	3	3	3	3	3	2	2	1	1	1	
54	1	1	1	7	7	3	6	3	1	1	1	1	1	1	
55	1	1	1	8	1	5	5	2	2	1	4	4	4	4	
56	1	1	1	8	1	5	5	2	2	1	4	4	4	4	
57	1	1	1	8	1	5	5	2	2	1	4	4	4	4	
58	1	1	1	8	1	5	5	2	2	1	4	4	4	4	
59	1	1	1	8	1	5	5	2	2	1	4	4	4	4	
60	1	1	1	1	1	1	1	4	4	4	2	1	1	3	
61	4	2	1	1	1	1	1	4	7	6	2	2	1	4	
62	2	3	2	1	1	1	1	3	10	7	5	5	5	5	
63	2	4	2	1	1	1	1	4	4	4	4	4	4	1	
64	5	5	3	2	2	1	1	1	1	7	1	1	1	2	
65	5	3	1	1	1	1	1	1	2	2	3	2	1	1	
66	5	5	3	3	1	1	1	1	1	2	2	1	1	1	
67	3	3	4	2	1	1	2	1	1	2	3	1	1	2	
68	39	60	59	51	41	45	13	47	18	5	9	5	15	4	

Mo Soak Interval

VMT MIX Inputs (Only 3 Vehicle Classes)

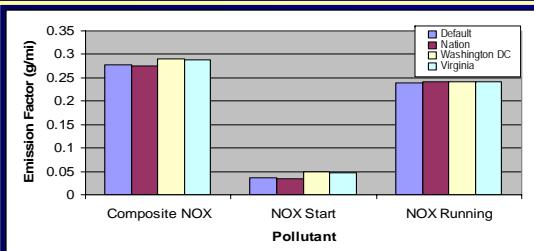
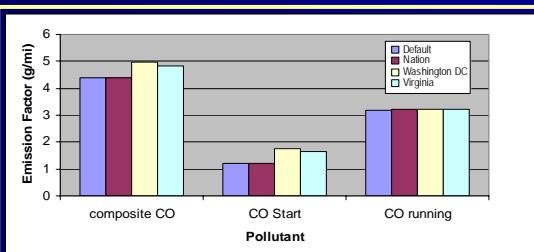
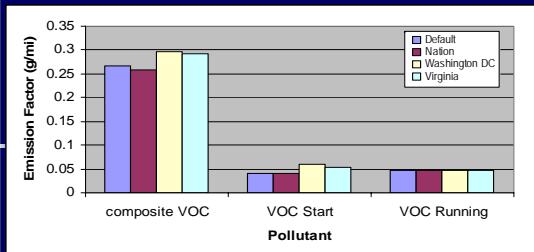


Summary-M6 Inputs

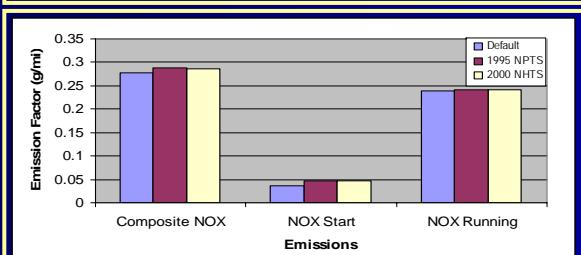
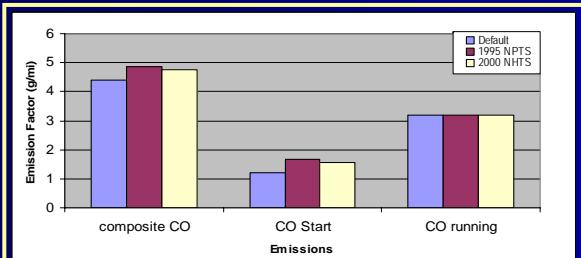
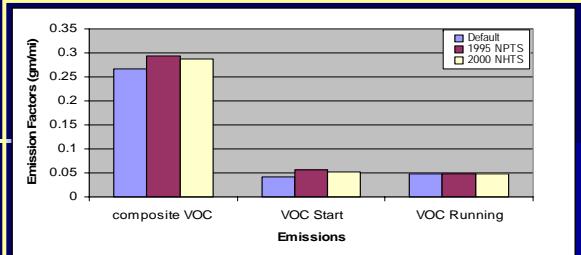
- NPTS based travel inputs that are different from M6 defaults
 - VMT Mix fro LDGV, LDGT1, LDGT2
 - VMT distribution
 - Cold Soak
 - Hot soak
 - Distribution of starts
- Regional Variation is visible



Change all travel inputs (1995 NPTS)



Comparison of Default, 1995 NPTS and 2000 NHTS



Summary - Emission Factor Sensitivity

- Emission factors sensitive to locality specific travel inputs.
- Start emission are effected mostly than running emissions (up to 20%)
- Composite emission rates are effected (up to 13%)



What we Learned

- Several of the travel related variables could be derived using NPTS
- Travel variable inputs vary significantly from MOBILE6 defaults
- MOBILE6 has been found sensitive to these inputs
- Care must be taken about the data gaps



Recommendations

- Local survey data is preferred for M6 vehicle and travel activity inputs
- No local data? NPTS data is ideal
- Simply repeat what we have done.....



Easier said...

- Issues with digging through NPTS by M6 modelers
 - Requires data analysis skills
 - Lack consistency if uniform data screening techniques are not adhered to
- How to make the process simple for an average M6 user?
 - A data mining tool
 - Travel Related Inputs Model for Mobile6 - **TRIMM**



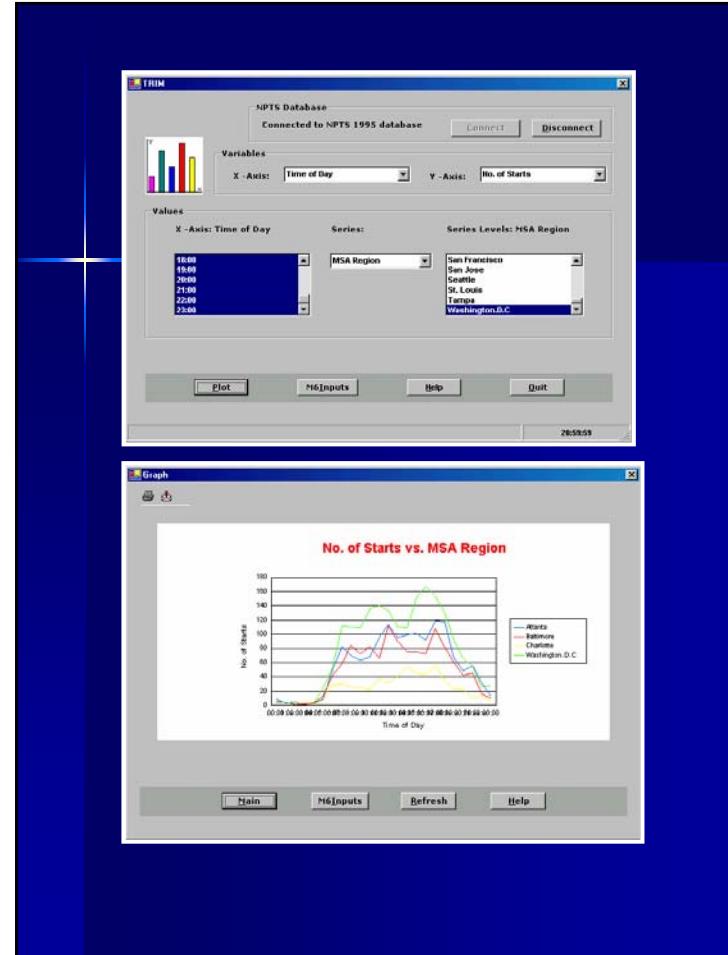
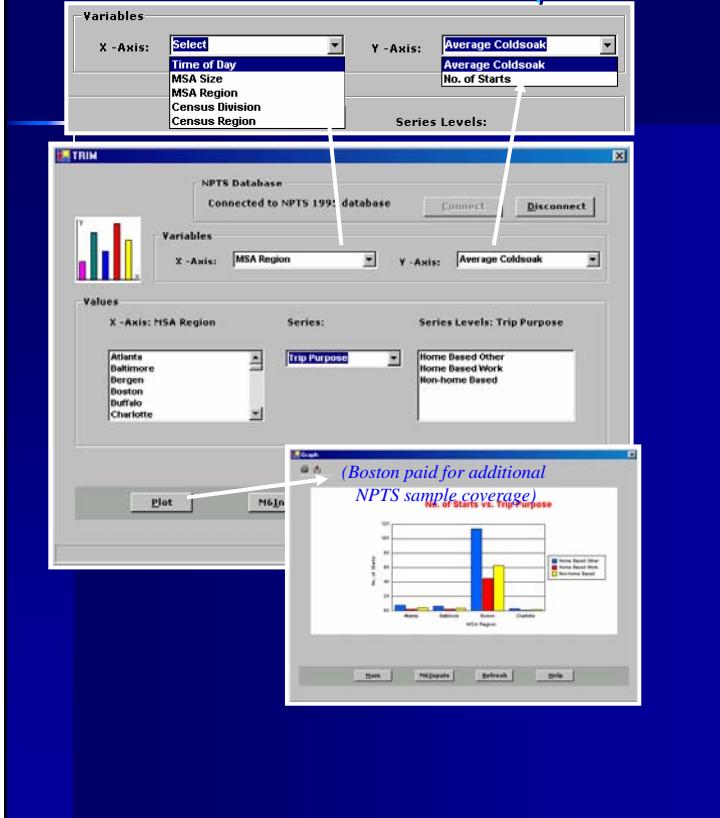
TRIMM

- ❖ Point and click for some M6 travel input files (e.g. *soakdist.d*)
- ❖ Based on the latest NPTS data
- ❖ User can:
 - ❖ Plot variables for specific geographies
 - ❖ Compare NPTS based inputs
 - ❖ With M6 defaults
 - ❖ Among geographies
 - ❖ Obtain alternative travel inputs to M6 defaults
- ❖ Microsoft .net based GUI
- ❖ Goal: web-based (abandoned)
- ❖ To be in public domain

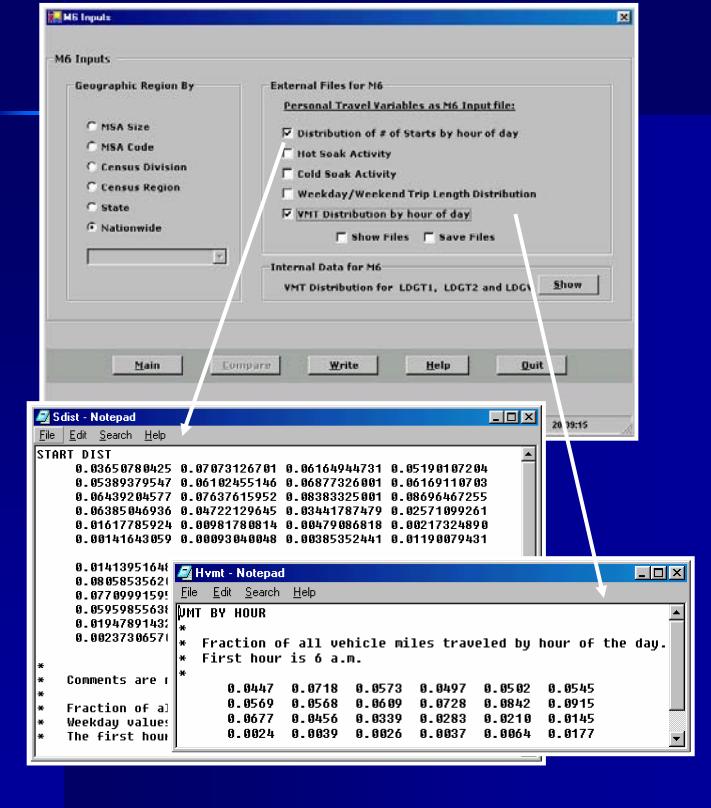
TRIMM Features

- Automatically mine the NPTS data ('90, '95, '00)
- Provide as many M6 inputs as possible
 - Write to files in M6 input format
- Various geographic levels of aggregation
- Compare variables within and with other geographies
- Compare NPTS based inputs to M6 defaults

User Can Simply Plot Some Travel Variables, or...



Choose to Write M6 Files



TRIMM Demonstration